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SUBMISSION OF SUBSTITUTE SPECIFICATION AND ABSTRACT

Commissioner for Patents
P.O. Box 1450
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Sir:

Submitted herewith is the substitute Specification and abstract, along with a marked-up copy of the substitute specification and abstract showing the changes made thereto, as discussed in the accompanying Preliminary Amendment.

Respectfully submitted,

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A SHOESTRING TYING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a shoestring tying apparatus for easily fastening a shoestring of a sport shoe or the like in a sure manner without using fastening tension by hand.

2. Description of the Related Art

Conventionally, a shoestring is laced through eyelets provided on the opening portion of a sport shoe or the like, and both ends of the shoestring are tied tightly at the ankle of the user. With athletic shoes, tension of the shoestrings is adjusted according to the required performance.

Sport shoes including a disk for winding up a shoestring on the instep thereof are known. The ends of the shoestring, provided at the opening portion which can be opened for the user to put on or take off the shoe, are fixed to the disk. Tension of the shoestring is adjusted according to the need of the user while winding the shoestring by rotating the disk in one direction, as disclosed in Japanese Unexamined Patent Application Publication No. 5-211906 (drawings) (which will be referred to as "patent document 1" hereafter).

On the other hand, in most cases, a conventional shoe 21 shown in Fig. 10 used for sports such as snowboarding, skiing, or the like, is formed with a great height for fitting up above the ankle. Thus, the shoe needs to be fastened to the ankle tightly so as to allow the user supple movement. Accordingly, it is important to fasten such a shoe tightly to the ankle. In addition, shoemakers are obligated to provide a fastening member 22 integrally formed on the opening portion or the like of the shoe so as to fasten the shoestring tightly, for the safety of the user. Various types of fastening members which can be employed for

the aforementioned fastening member 22 are known. For example, arrangements have been proposed as disclosed in Japanese Unexamined Patent Application Publication No. 6-237802 (all pages) (which will be referred to as "patent document 2" hereafter), Japanese Unexamined Patent Application Publication No. 7-208 (all pages) (which will be referred to as "patent document 3" hereafter), and Japanese Unexamined Patent Application Publication No. 8-506253 (Fig. 1) (which will be referred to as "patent document 4" hereafter).

The aforementioned patent document 1 describes an adjusting device for adjusting the tension of the shoestring. The adjusting device has a configuration wherein both ends of a shoestring serving as a fastening member are inserted and fixed to a disk having a plate spring fixed thereto. The user pulls the plate spring fixed to the disk so as to rotate the disk for winding the shoestring to the disk, whereby tension of the shoestring can be adjusted. Note that the user should pull the plate spring only one time so as to adjust tension of the shoestring. On the other hand, the aforementioned patent documents 2 through 4 describe tying apparatuses having a configuration wherein the ends of a shoestring are integrally fixed to a winding device beforehand. The user rotates an operating rotor of the winding device several dozen times by hand in order to gradually fasten the shoestring.

The fastening member 22 for a shoestring of any of the aforementioned patent documents 2 through 4 has a configuration for fastening the shoestring 23 in a sure manner, as shown in Fig. 10. With regard to snowboard shoes or the like with a great height for the ankle, the user rotates a rotational cap (operating member) 24 or the like serving as a rotor of the fastening member 22 by hand in order to fasten the shoestring 23. However, with regard to any of the aforementioned arrangements, there is a need to rotate the aforementioned rotational cap 24 several dozen times so as to fasten the shoestring 23,

which is troublesome for the user. In particular, in many cases, the fingers of the user are so numbed with cold in the winter season that securely operating the fastening member 22 by rotating the aforementioned rotational cap 24 becomes difficult.

SUMMARY OF THE INVENTION

The present invention has been made in order to solve the aforementioned problems. Accordingly, it is an object thereof to provide a shoestring tying apparatus having an improved configuration which eliminates the above-described problem in that the user is required to rotate the operating rotor of the conventional fastening member by hand.

Another object of the present invention is to provide a shoestring tying apparatus which is small in size and easy to use.

Further, it is another object of the present invention to provide a shoestring tying apparatus for fastening a shoestring very quickly and in a sure manner, by repeating a simple pulling operation of an operating cord in one direction several times.

Furthermore, it is another object of the present invention to provide a small-sized, easy-to-use, and portable shoestring tying apparatus, having a simple configuration including a fastening member which can be detachably fit to the conventional operating rotor, thereby enabling the shoestring to be quickly fastened.

A shoestring tying apparatus according to one aspect of the present invention comprises a fastening member for fastening (tightening) a shoestring having a configuration including a disk, to which one end of the shoestring is connected, which is supported by a shaft for winding up the shoestring; and an operating member for rotating the fastening member. In the event that the operating rotational member is rotated in a predetermined direction, the disk of the fastening disk is rotated so as to wind up the

shoestring, thereby tying the shoestring. In the event that rotation of the fastening member is stopped, tension of the shoestring is maintained. In the event that engagement of the operating rotational member and the fastening member is released, and the disk is rotated in the reverse direction so as to be returned to the initial state, the shoestring is released. A fitting portion is provided for connecting the rotational member to the operating member, and a driving mechanism for rotating the fitting portion is also provided. The driving mechanism is manually or automatically operated so as to rotate the operating member several times, and so as to rotate the disk of the fastening member, thereby tying the shoestring. The fitting portion of the rotational member may be fitted to the face of the operating member.

The driving mechanism may comprise a cylinder including an elastic member fixed to the rotational shaft thereof for winding an operating cord on the outer circumference thereof, a restricting mechanism including an engaging member disposed so as to allow the cylinder to rotate in a predetermined direction and so as to prevent the cylinder from rotating in the reverse direction, and a connection portion for connecting to the operating rotational member. Upon the user pulling the operating cord wound on the outer circumference of the cylinder, the cylinder is rotated, and the elastic member is wound up.

The rotational member may be disposed between the operating member and the fastening member, and may be rotated by manual or automatic operation of the driving mechanism so as to rotate the disk of the fastening member several times, thereby tying the shoestring.

The shoestring tying apparatus according to another aspect of the present invention comprises a fitting portion which rotates along with an operating member connected to a fastening member for fastening a shoestring. A rotational member including a cylinder is

integrally formed with the fitting portion, and an elastic member is included within a cylinder of the rotational member. One end of the elastic member is fixed to the rotating shaft of the rotational member so that the elastic member is wound up when the rotational member is rotated in the direction for tying the shoestring. A ratchet including an engaging pawl is provided for allowing rotation in a predetermined direction, and the ratchet rotates so as to return to the initial state due to the elastic force of the elastic member at the time of releasing engagement of the engaging pawl and the rotational member. An operating cord rotates the rotational member, a divided cover member stores the fitting member, and a driving mechanism includes the elastic member, the ratchet, and the operating cord. The operating cord can be extracted from the cover member, and at the time of extracting the operating cord, the cylinder of the rotational member and the fitting portion are rotated in the direction for tying the shoestring, as well as winding up the elastic member. At the time of releasing the operating cord following the extracting operation, the operating cord is retracted inside due to the returning action of the elastic member, and only the ratchet is rotated in the reverse direction without the rotational member being rotated. At the time of extracting the operating cord from the cover member again, the rotational member is rotated.

The shoestring tying apparatus according to another aspect of the present invention comprises a rotational member including one or the other of a fitting portion integrally formed on the operating rotational member, and a fitting portion for fitting to the operating member. A cylinder including an internal gear on the inner face thereof is disposed adjacent to the fitting portion. A ratchet includes pawl-storage portions on the outer circumference thereof for storing multiple pawls for engaging the internal gear, includes an engaging opening on a predetermined side thereof, and includes a shaft fitting opening at the center thereof for rotatably fitting to a rotational shaft, which is fit within the

cylinder of the rotational member. A spring storage member includes a protrusion on a predetermined side thereof for engaging the engaging opening of the ratchet, includes a recessed groove on the outer circumference thereof for winding up an operating cord, includes a space formed therein for storing a helical spring, and includes a through hole for rotatably fitting to the rotational shaft to which one end of the spring is fixed. A cover member includes a back cover, having a fitting opening on the center thereof for fitting to and supporting the rotational shaft, for covering the spring storage member, and includes a front cover, having an opening on the side of the fitting portion of the rotational member, for covering the entire rotational member. The pawls of the ratchet for engaging with the internal gear of the rotational member are forced at all times in the direction for being engaged with the internal gear of the rotational member by an elastic member so as to be stored in the pawl-storage portions, and the rotational shaft to which one end of the spring is fixed is rotatably fit to the spring storage member. The spring storage member including the wound spring is fit and mounted within the back cover so that one end of the rotational shaft is fit to the shaft opening of the back cover, and the protrusion of the spring storage member is engaged with the engaging opening of the ratchet of the rotational member. One end of the operating cord is connected to the free end of the spring, and the front cover is fit to the back cover, and the other end of the operating cord can be extracted outside.

A shoestring tying apparatus according to another aspect of the present invention, integrally mounted to a shoestring for tying the shoestring, comprises: a rotational member, connected to a disc and a fastening member, for rotating the disc and fastening member; a ratchet for rotating in a predetermined direction while engaging the rotational member, but for rotating in the reverse direction without load without engaging the rotational member; a helical spring disposed so that one end thereof is fixed to a center

shaft of the rotational member, and the other end thereof is fixed to the circumference of the rotational member or is extracted outside from a slit on the circumference; an operating cord which is fixed to the outer circumference of the rotational member or the end of the helical spring extracted from the slit on the circumference, and is wound up on the outer circumference along a recessed groove formed thereon; and a cover member which covers the rotational member. The cover member includes an opening for extracting the end of the operating cord, and rotatably supports the center shaft of the rotational member. When the user extracts the operating cord outside from the opening of the cover member, the ratchet is rotated and the helical spring is wound up, thereby rotating the disc and fastening member for the shoestring through the ratchet or the rotational member engaging the ratchet. Thus, when the user performs an operation in which the operating cord is alternately extracted and retracted several times, the shoestring is tied.

With the shoestring tying apparatus according to the present invention, the fitting portion thereof is fit to the operating member having the fastening member provided at the shoestring portion of the shoe. The fitting portion includes a slip-preventing member for holding the conventional operating member in a sure manner.

With the shoestring tying apparatus according to the present invention, the user is not required to operate the operating member connected to the conventional shoestring tying apparatus by hand. The shoestring can be fastened in a short time by a user operating the operating cord several times.

With the shoestring tying apparatus according to the present invention, the cover member may be formed in the shape of an egg, an ellipse, a grand piano, round, square, or the like, in any desired color, so as to improve the portability and appearance of the shoestring tying apparatus.

The shoestring tying apparatus according to the present invention has a simple

configuration integrally formed of the spring storage member for storing the helical spring serving as a small-sized elastic member, and the ratchet, thereby enabling the shoestring tying apparatus to be manufactured with low costs.

Furthermore, the aforementioned cover member may include a connection member (in the shape of a key-ring) for detachably connecting the shoestring tying apparatus to the user. In this case, the portability of the shoestring tying apparatus is further improved, and the user can quickly use the shoestring tying apparatus when necessary. Furthermore, this prevents the user from losing the shoestring tying apparatus.

With the shoestring tying apparatus according to the present invention, the user can fasten the shoestring very quickly and in a sure manner. Furthermore, the shoestring tying apparatus is small in size and easy to use, and also has excellent portability, so the user can carry the shoestring tying apparatus in a pocket or the like, thereby improving the portability and appearance of the apparatus.

With the shoestring tying apparatus according to the present invention, the shoestring can be easily fastened by a simple operation wherein the user fits the fitting portion thereof to the conventional fastening member, and pulls the operating cord.

The shoestring tying apparatus according to the present invention can be fitted to a conventional fastening member for fastening the shoestring of sport shoes or the like. With the shoestring tying apparatus, the user is not required to repeat the rotating operation by hand several times. Furthermore, the user can fasten the shoestring easily and tightly in a sure manner, even in the winter season. Furthermore, the shoestring tying apparatus according to the present invention may be included in a conventional tying apparatus, thereby enabling the cap (operating member) of the conventional tying apparatus to be easily rotated. In this case, the shoestring tying apparatus according to the present invention is included as a standardized shoestring tying apparatus, thereby

providing easy-to-use shoestring tying apparatuses in the market.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a cross-sectional diagram which illustrates a shoestring tying apparatus according to a first embodiment of the present invention;

Fig. 2 is a perspective view which illustrates the overall (entire) shoestring tying apparatus according to the first embodiment of the present invention;

Fig. 3 is an exploded perspective view of the shoestring tying apparatus according to the first embodiment and shown in Figs. 1 and 2;

Fig. 4 is an exploded perspective view as viewed from the back in Fig. 3;

Fig. 5 is a an exploded perspective view which illustrates a shoestring tying apparatus according to a second embodiment of the present invention;

Fig. 6 is a an exploded perspective view for describing the internal configuration of the shoestring tying apparatus according to the second embodiment, wherein a cover member is omitted;

Figs. 7A and 7B are cross-sectional diagrams for describing the internal configuration of the shoestring tying apparatus according to the second embodiment, wherein Fig. 7A shows a state wherein an operating rotor is not engaged with a rotational member, and Fig. 7B shows a state wherein the operating rotor is engaged with the rotational member;

Fig. 8 is an exploded perspective view which shows the internal configuration of a ratchet according to the second embodiment;

Fig. 9 is a perspective view which illustrates a shoe including the shoestring tying apparatus according to the present invention; and

Fig. 10 is a perspective view which illustrates a shoe including a conventional

shoestring tying unit.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A description will be made below of embodiments of a shoestring tying apparatus according to the present invention with reference to the drawings.

A shoestring tying apparatus according to the present invention comprises a fitting portion 3 for fitting the apparatus to a rotational cap 24 which is a conventional operating rotor, or an external gear 304 for engaging an internal gear 303 provided in a rotational cap (operating member) 324. A rotational member 5 rotates the fitting portion 3 or the external gear 304. A driving mechanism such as an automatic mechanism using a forced elastic member, an electric motor with a battery, or a manual mechanism in which a cord, wire, or the like is manually operated for directly rotating the rotational member 5, may be employed as a driving source for rotating the rotational member 5.

A description will be made below of a shoestring tying apparatus including a manual mechanism serving as the driving mechanism, with reference to the drawings.

As shown in Fig. 1, a shoestring tying apparatus 1 shown in Fig. 1 according to a first embodiment includes a cover 2 (front cover 2a and back cover 2b) formed of colored resin for storing the internal configuration components thereof. The shoestring tying apparatus 1 further comprises a rotational member 5 including a partition 5a, wherein a fitting portion 3 is formed on one side of the partition 5a for connecting the apparatus to a fastening member 22 with a rotational cap (operating member) 24 which is a conventional operating rotor or an outer rotational portion thereof, and including an internal gear 4 formed on the internal circumference (on the other side) of the partition 5a. The driving mechanism of the shoestring tying apparatus 1 comprises a restricting device including a ratchet 8 and a pawl (engaging member) 6 at a pawl storage section 7 of the ratchet 8 for

engaging the internal gear 4. A cylindrical spring storage member 9 is in contact with the side of the ratchet 8, and a helical spring (elastic member) 10 is included in the spring storage member 9. An operating cord 11 is connected to the spring storage member 9, and a rotational shaft 12 is also provided.

One end of the spring 10 included in the aforementioned spring storage member 9 is fixed to the rotational shaft 12, and the other end is fixed to the back side of the spring storage member 9, or is extracted outside from an opening on the outer face of the spring storage member 9 so as to be connected to the operating cord 11.

The ratchet 8 includes a plate spring (not shown) fixed to a slit 13 at the pawl storage section 7, and the plate spring is an elastic member for forcing the pawl 6 in a direction so that the pawl 6 engages with the internal gear 4 of the rotational member 5 at all times. Furthermore, the ratchet 8 includes one or more engaging openings 14 formed on one side thereof for engaging protrusions 15 formed on the side of the spring storage member 9. Furthermore, the ratchet 8 and spring storage member 9 include shaft openings 8a and 9a, respectively, for rotatably holding the rotational shaft 12 fixedly fit to a support opening 16 on the back cover 2b.

Next, description will be made regarding the operation of the shoestring tying apparatus according to the present invention.

The cover 2 includes a combination of the front cover 2a and the back cover 2b. Furthermore, the cover 2 includes a through-hole 18 on the circumference thereof or at a portion near the circumference thereof for inserting the operating cord 11 which is to be wound to the spring storage member 9. The front cover 2a includes a round opening 19 for inserting the fitting portion 3 therethrough, and the fitting portion 3 is then fit to the fastening member (or, specifically, the rotational cap 24) for the shoestring 23. On the other hand, the back cover 2b includes the support opening 16 at a position corresponding

to the center axis of the round opening 19.

As shown in Figs. 3 and 4, while the shoestring tying apparatus has the round opening 19 on the side of the front cover for the fitting portion 3, the shape of the opening is not restricted to being round. The fitting portion 3 includes a slip-preventing surface 20 which is an uneven surface formed on the internal circumference of fitting portion 3. The slip-preventing surface 20 is formed in order to hold the rotational cap 24 of the fastening member 22 for the shoestring 23, which is fit to the fitting portion 3, in a sure manner without slipping, and has multiple grooves or the like, for example. An arrangement may be made in which the fitting portion 3 is integrally formed on the rotational cap 24 serving as an operating rotor.

The spring storage member 9 for storing the helical spring 10 serving as an elastic member includes a recessed groove 17 on the outer face thereof, as shown in Figs. 1 and 3. While the drawings show an arrangement in which the ratchet 8 engages the spring storage member 9 with the engaging openings 14 and the protrusions 15, an arrangement may be made in which the ratchet 8 and the spring storage member 9 are formed integrally. The spring 10 is formed of a plate spring wound in a helical manner. The spring 10 is stored in the spring storage member 9 so as to be elastically pressed into contact with the inner face thereof.

In another embodiment, an arrangement may be made in which the spring storage member 9 does not include an opening on the recessed groove 17 on the outer face thereof. Instead, one end of the spring 10 is fixed to the inner face of the spring storage member 9 on the back of the recessed groove 17, and one end of the operating cord 11 is fixed to the recessed groove 17 on the outer face thereof, and is wound on the spring storage member 9 along the recessed groove 17.

With the present embodiment, the rotational shaft 12 passes through the shaft

opening 9a of the spring storage member 9 including the spring 10, and is held by the support opening 16 of the back cover 2b. Furthermore, the base end of the spring 10 is fixed to the rotational shaft 12, and the other end serving as a free end is connected to the operating cord 11.

With the above-described configuration, when the user pulls the operating cord 11, the spring storage member 9 fixed to the end of the operating cord 11 is rotated, or the spring 10 is extracted through the opening in the outer face of the spring storage member. Accordingly, the spring storage member 9, where the spring 10 is wound and pressed into contact with the inner face on the back of the recessed groove 17, is rotated, whereby the ratchet 8 is rotated.

In the arrangement in which the free end of the spring 10 is fixed to the spring storage member 9, and one end of the operating cord 11 is fixed to the spring storage member 9, when the user pulls the operating cord 11, the spring storage member 9 is rotated so as to wind up the spring 10. Subsequently, when the user releases the operating cord 11 from the pulling force, the operating cord 11 is retracted back and is wound on the spring storage member 9 along the recessed groove 17 formed on the outer face thereof due to the returning force of the spring 10.

Further description will be made below regarding the shoestring tying apparatus according to the present embodiment of the present invention.

As shown in the cross-sectional diagram shown in Fig. 1, with the shoestring tying apparatus according to the present embodiment having such a configuration, when the user pulls a tab or the like at the end of the operating cord 11 of the driving mechanism by hand so as to extract the operating cord 11 from the shoestring tying apparatus 1, the spring storage member 9 is rotated so as to rotate the ratchet 8 where the spring storage member 9 engages therewith on the side. The rotational member 5 is also rotated due to rotation of

the internal gear 4 of the rotational member 5 engaging the pawl 6 of the ratchet 8 (portions of the driving mechanism). Thus, the fastening member 22 for the shoestring 23 is rotated through the fitting portion 3 of rotational member 5 having the slip-preventing surface 20. Subsequently, when the user releases the operating cord 11 from the pulling force, the spring storage member 9 rotates due to returning action of the spring 10. Accordingly, the operating cord 11 is stored so as to be wound on the spring storage member 9 on the outer face along the recessed groove 17. Note that, at this time, the pawl 6 of the ratchet 8 does not engage with the internal gear 4 of the rotational member 5, so that the ratchet 8 is rotated without load. When the user pulls the operating cord 11 again, the spring 10 is extracted, or the spring storage member 9 is rotated, whereby the rotational member 5 is rotated.

The operating cord 11 may be formed of a nylon cord, a metal wire, a belt, or the like, and may have a ring provided at one end of the operating cord 11. As described above, the other end of the operating cord 11 is fixed to the outer face of the spring storage member 9 including the spring 10 pressed into contact with the inner face thereof. The operating cord 11 is wound to the spring storage member 9 on the outer face thereof, and is extracted from the through hole 18 on the cover 2, as shown in Fig. 2.

Next, a description will be made of a tying method for the shoestring using the shoestring tying apparatus 1 according to the present invention.

First, the fitting portion 3 of the shoestring tying apparatus 1 according to the present invention is fit to the rotational cap (operating member) 24 of the fastening member 22 mounted on the shoe 21 shown in Fig. 10 (see Fig. 9), so as to tightly hold the rotational cap 24 through the slip-preventing surface 20 formed of grooves or the like. As a result, the fastening member 22 and the shoestring tying apparatus 1 are operated as a single unit.

Next, when the user pulls the operating cord 11 so as to rotate the spring storage member 9, the ratchet 8 and the rotational member 5 are rotated, as described above. Thus, the fitting portion 3 integrally formed on the rotational member 5 is rotated so as to rotate the rotational cap 24 in the rotational direction to allow the fastening member 22 of the shoe 21 to tighten the shoestring. The fastening member 22 has a conventional configuration for tying (tightening) the shoestring 23 of the shoe 21, whereby the shoestring 23 is fastened by rotation thereof.

In this case, even in the event that the user only slightly pulls the operating cord 11, the rotational member 5 rotates several times. Accordingly, when the user performs a simple pulling operation on the operating cord 11, the fitting portion 3 is rotated several dozen times. Accordingly, the fastening member 22 is easily rotated, so that the shoestring is fastened. Thus, with the shoestring tying apparatus 1 according to the present invention, when the user performs pulling operations in which the operating cord 11 is alternately extracted and retracted several times, the fitting portion 3 and the fastening member 22 can be easily rotated several dozen times.

The shoestring tying apparatus 1 according to the present invention has a simple configuration in which the ratchet 8 is disposed adjacent to the spring storage member 9 to form the driving mechanism, and the rotational member 5 includes the internal gear 4 and the fitting portion 3.

The spring 10 is included within the spring storage member 9 with one end thereof fixed to the rotational shaft 12 which is fit to the support opening 16 on the back cover 2b. The ratchet 8 engages the spring storage member 9, and the pawl 6 of the ratchet 8 engages the internal gear 4 of the rotational member 5, thereby enabling the rotational member 5 to be rotated in a sure manner. The complete configuration of the shoestring tying apparatus 1 further includes the front cover 2a fit to the other configuration.

As described above, with the shoestring tying apparatus 1 according to the present invention, the rotational cap 24 of the conventional fastening member can be easily rotated several dozen times by performing a pulling operation in which the operating cord 11 is alternately extracted and retracted just once or twice. As described above, the user performs the pulling operation so that the operating cord 11 is alternately extracted and retracted, and there is no need to rotate the fastening member by hand. Accordingly, the tying operation becomes markedly simple, thereby eliminating troublesome tasks for the user. Furthermore, even in the event that the fingers of the user are numbed with cold in the winter season, the user can easily tie the shoestring without trouble. Furthermore, as described above, the shoestring is tied by simply performing the fastening operation in which the operating cord 11 is alternately extracted and retracted several times, thereby enabling the shoestring to be tied in a quick and sure manner.

Although the cover 2 of the shoestring tying apparatus 1 described above is formed in a round shape as shown in the drawings, the shape thereof is not restricted to being round, but rather, the cover 2 may be formed in any shape which improves portability and appearance.

Next, a description will be made of a shoestring tying apparatus according to a second embodiment with reference to Figs. 5 through 8.

As shown in the drawings, a cap (operating member) 324 includes multiple pawls 301 on the inner face thereof for engaging a gear wheel so as to rotate in one direction, includes an internal gear 303 on the inner side of the pawls 301, and includes a gear wheel 302 on the inner side of the internal gear 303 which can move within the cap 324. A hexagonal shaft 314 is fit to the gear wheel 302. Note that the cap 324 can be slidably moved along the hexagonal shaft 314.

On the other hand, a rotational member 305 includes an external gear (fitting

portion) 304 for engaging the internal gear 303 of the cap 324, an inner spring for forcing the operating cord 11, and a shaft 312 which is rotatably fit to the aforementioned hexagonal shaft 314. The rotational member 305 further includes a ratchet 308 for engaging an internal gear provided on the inner face of rotational member 305, and a cylinder 309 which is an internal core around which the operating cord 11 is to be wound for storage. The rotational member 305 is rotatably fit to an outer cylinder 310 fixed to a base 313. The outer cylinder 310 includes an external gear 310a on the outer face thereof for engaging the aforementioned pawls 301 of the cap 324.

The base 313 is fixed at a predetermined position of the shoe 21, and includes a rotational cylinder on which both ends of the shoestring 23 are wound, and also includes the hexagonal shaft 314.

Description will be made with regard to the operation of the shoestring tying apparatus having this configuration according to the present embodiment.

First, a description will be made of the state of the shoestring tying apparatus shown in Fig. 7A with reference to Figs. 5 and 7A. When the user rotates the cap 324 in the direction A with the tips of the pawls 301 on the inner face of the cap 324 slidably being in contact with the outer face of the external gear 310a of the outer cylinder 310, the hexagonal shaft 314 is rotated. Accordingly, the shoestring 23 is tied (description regarding the internal configuration will be omitted). Next, when the user releases the cap 324 from the base 313 (see Fig. 7A), the engagement of the external gear 310a of the outer cylinder 310 and the pawl 301 is released, so that the shoestring 23 is released.

Next, description will be made regarding the state of the above-described shoestring tying apparatus shown in Fig. 7B. When the user pulls the operating cord 11, the ratchet 308 is rotated against the elastic force of the spring included in the outer cylinder 309, whereby the rotational member 305 is rotated. The external gear 304 of the

rotational member 305 engages the internal gear 303 of the cap324. Accordingly, the cap 324 is rotated, so that the shoestring 23 is fastened through the hexagonal shaft 314. Subsequently, when the user releases the operating cord 11 so that the cord is returned to the initial position, the ratchet 308 is rotated, but the rotational member 305 is not rotated. Accordingly, when the user performs the pulling operations in which the operating cord 11 is alternately extracted and retracted several times, the cap 324 and the hexagonal shaft 314 are rotated, whereby the shoestring 23 is tied.

As described above, when the user pulls the operating cord 11, the ratchet 308 is rotated. Accordingly, the rotational member 305 and external gear 304 are rotated, as well. Note that the spring is wound up at the same time as the spring is being rotated. The spring is rotated several times with each pulling operation. When the user releases the engagement, the spring is returned to the initial state.